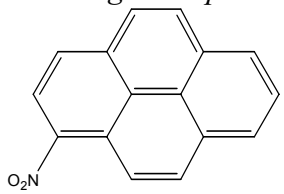
NITROARENES (SELECTED)

1-NITROPYRENE
CAS No. 5522-43-0

First Listed in the *Eighth Report on Carcinogens*



CARCINOGENICITY

1-Nitropyrene is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of malignant tumor formation in multiple species of experimental animals, at multiple sites and by multiple routes of exposure (reviewed in IARC V.46, 1989).

Intraperitoneal (i.p.) injections of 1-nitropyrene in the strain A mouse increased lung tumors in males and females, with the numbers of adenomas per mouse lung also increased (El-Bayoumy and Hecht, 1983; El Bayoumy et al., 1984). When administered by subcutaneous (s.c.) injections, 1-nitropyrene induced injection site sarcomas in male and female rats and mammary tumors (including adenocarcinomas) in female rats (Hirose et al., 1984; cited by IARC V.46, 1989; Imaida et al., 1995). Intraperitoneal injections of 1-nitropyrene in mice caused liver-cell tumors in males (Wislocki et al., 1986; cited by IARC V.46, 1989). A study in female rats injected i.p. with 1-nitropyrene showed increased mammary tumors; a second i.p. study demonstrated a nonstatistically significant increase in mammary tumors (IARC V.46, 1989; Imaida et al., 1991a). Mammary gland tumors were also increased following oral administration of 1-nitropyrene to female rats (El-Bayoumy et al., 1988; 1995). Intratracheal administration of 1-nitropyrene, adsorbed onto carbon black particles, to hamsters demonstrated a weak but significant increase in lung tumors over particle only controls (Moon, et. al., 1990).

There are no data available to evaluate the carcinogenicity of 1-nitropyrene in humans.

ADDITIONAL INFORMATION RELEVANT TO CARCINOGENESIS OR POSSIBLE MECHANISMS OF CARCINOGENESIS

1-Nitropyrene has been evaluated for carcinogenicity in several other rodent studies by various routes of exposure with generally negative results; however, these studies are limited by small numbers of experimental animals and short durations of dosing and observation (IARC V.46, 1989). 1-Nitropyrene is genotoxic in a wide variety of assays in bacteria and mammalian cells including human cells and cells from likely target organs i.e. lung, demonstrates consistent evidence of cell transformation activity *in vitro* in both finite life-span and immortal cell lines including human cells, and has demonstrated ability to form DNA adducts *in vitro* and *in vivo*. Importantly, adducts have been detected in the lung following intratracheal instillation of 1-nitropyrene thus supporting potential genotoxic activity in a likely target organ in humans (IARC V.46, 1989; Chan, 1996).

No data are available that would suggest that the mechanisms thought to account for tumor induction of 1-nitropyrene in experimental animals would not also operate in humans.

PROPERTIES

1-Nitropyrene occurs as yellow needles or prisms from ethanol, and it has a melting point of 155°C. It is very soluble in diethyl ether and is soluble in ethanol and benzene at 15°C and in toluene and tetrahydrofluorenone, and moderately soluble in acetone. 1-Nitropyrene reacts with ethanolic potassium hydroxide to form 1,1′-azoxypyrene, and with zinc powder in ethanol (in the presence of catalytic amounts of ammonium chloride or ammonia) to form 1,1′-azoxypyrene or, without air, 1-aminopyrene and 1-hydroxylaminopyrene. 1-Nitropyrene degrades to 2-propanol following exposure to ultraviolet/visible light. When is heated to decomposition, 1-nitropyrene emits toxic fumes of nitrogen oxides (NO_x).

USE

1-Nitropyrene has been reported to be a chemical photosensitizer, increasing the spectral sensitivity of bis-azide compounds in the long-wavelength region. One foreign company uses 1-nitropyrene as an intermediate in the production of 1-azidopyrene, which is used in photosensitive printing. 1-Nitropyrene is available for research purposes at 97% or ≥99.5% purity with ≤0.1% total dinitropyrenes and pyrene. It is available at a purity of 99.68% as a reference material (IARC V.46, 1989).

PRODUCTION

Since 1972, one foreign company has produced 1-nitropyrene by the reaction of pyrene with nitric acid (IARC V.46, 1989). One American company produces 1-nitropyrene (SRI, 1992), and Chem Sources identified six U.S. suppliers (Chem Sources, USA, 1992). No data on imports or exports of 1-nitropyrene were available.

EXPOSURE

The primary route of potential human exposure to 1-nitropyrene is inhalation. Low concentrations of 1-nitropyrene have been found in ambient airborne particulates. 1-Nitropyrene has also been detected in stack gases from coal-fired power plants and aluminum smelters, and in particulate emissions from other stationary sources and from diesel and gasoline engines. Prior to 1980, some carbon black samples known to be used in photocopy machines were found to contain considerable quantities of nitropyrenes. 1-Nitropyrene has also been detected in the wastewater from gasoline service stations and in river sediment (IARC V.46, 1989). 1-Nitropyrene is not listed in the National Occupational Exposure Survey or the National Occupational Hazard Survey conducted by NIOSH.

REGULATIONS

1-Nitropyrene is subject to report/recordkeeping requirements under SARA. OSHA regulates 1-nitropyrene under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-94.